HEAT FROM WOOD
FOR BRABANT LAKE, SASK.
A Feasibility Study

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A FEASIBILITY STUDY FOR BRABANT LAKE, SASK.

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ABBREVIATIONS USED IN REPORT

C.O.S.P.	Canada Oil Substitution Program (A program of Energy, Mines and Resources Canada)
R.R.A.P.	Residential Rehabilitation Assistance Program (A program of Canada Mortgage and Housing Corporation)
C.M.H.C.	Canada Mortgage and Housing Corporation
C.S.A.	Canadian Standards Association
D.N.S.	Department of Northern Saskatchewan (A department of the provincial government)

HEAT FROM WOOD
BRABANT LAKE, SASKATCHEWAN

Executive Summary

This study undertook to examine in detail current practices in generating energy from wood-fired appliances in the remote community of Brabant Lake, Saskatchewan (population 140; 27 homes), and to illustrate to residents of both Brabant and Southend, Saskatchewan how cost efficiency and safety might be improved.

The study found that a broad range of circumstances over which residents have very little control, have profoundly influenced current energy consumption practices, and that the brevity of the experience with modern conversion technology poses some serious problems related to safety.

Problems noted include:

- the availability of well-seasoned wood will quickly diminish over the next 3 years, and will be replaced by fuel wood with a much higher moisture content.

- chimneys installed in the pre-1975 units are not adequate for continuous solid fuel use, and the potential for serious house fires occurring in these units over the next 5 years is high.

- there may have been too much concern for energy efficiency in the selection of wood-burning furnaces and space heaters for the remote communities with ready access to a fuel wood supply. Increasing efficiency of the combustion process, and extending the periods between refueling in the modern units, has been achieved by better controlling and directing the burn. The trade-off has been an increase in the potential for creosote build-up. The result may have been a higher incidence of chimney/house fires, and the related expense to the home owner and the public in order to conserve an inexpensive and readily available fuel.

- of more critical concern to the average resident in Brabant Lake than the cost of space heat energy, is the cost of water heat and cooking. Traditionally, one wood-fired unit has served all three purposes. In these "modern" homes, the "space" heater provides no surface for water heating or cooking. The result is high electrical service costs, particularly when the cost per kwh to the consumer ranges from 6 to 16 cents (depending on consumption).

- housing units with water pressure systems installed, which must be maintained at above freezing temperatures year round, are prohibitively expensive for low income families in remote communities where the cost of electrical power is high.

- the level of social assistance available through the D.I.A.N.D. program does not accommodate the occupants of units with water pressure systems, and subsequent higher electrical costs.

- some of the premises upon which "building standards" and design decisions affecting public housing programs for remote areas are being made should be re-examined with provision for end user input on "life style" and liveability. Wood-fired cook stoves might be a partial solution to high electrical energy costs, but the existing housing designs will not readily accommodate them.

The report concludes that local councils and local residents can take a number of steps to enhance the safety of wood-heating practices. Among those steps are: proper operation and maintenance of equipment, and employment by councils of a part-time fire chief to ensure fire safety measures are undertaken. The report also concludes that electricity costs can be reduced if homeowners use wood fired cook stoves and water heaters and notes that some financial assistance is available to homeowners who might wish to upgrade their wood burning equipment. Finally, the authors say that the community meetings, at which information was shared, seemed to be well received. The report recommends that participatory workshops and seminars be held in other communities.

The study was done by Bell, Ahenakew and Associates and the Saskatchewan Research Council for the Brabant Lake Council with a contribution from the Remote Community Demonstration Program of Energy, Mines and Resources Canada.

CHAUFFAGE AU BOIS

BRABANT LAKE (SASKATCHEWAN)

Résumé

La présente étude avait pour objectif d'examiner en détail les pratiques de la production d'énergie à partir d'appareils au bois dans la collectivité éloignée de Brabant Lake (140 Habitants; 27 maisons), en Saskatchewan, et de montrer à la population de Brabant Lake et de Southend (Sask.) comment la rentabilité et la sécurité pourraient être augmentées.

L'étude a montré qu'une vaste gamme de circonstances sur lesquelles la population a très peu d'emprise ont grandement influencé les pratiques en matière de consommation d'énergie et que le peu d'expérience de la technologie moderne de la conversion pose de sérieux problèmes sur le plan de la sécurité.

Voici les problèmes relevés:

- l'approvisionnement de bois sec diminuera rapidement au cours des trois prochaines années et sera remplacé par du bois de chauffage ayant une teneur en humidité beaucoup plus élevée.

- les cheminées installées dans les unités construites avant 1978 ne conviennent pas à l'utilisation continue des combustibles solides, et le risque que surviennent de graves incendies dans ces unités au cours des cinq prochaines années est élevé.

- il se peut que l'on ait accordé trop d'importance au rendement énergétique dans le choix des chaudières et des générateurs de chaleur alimentés au bois, dans le cas des collectivités éloignées qui peuvent se procurer facilement du bois de chauffage. L'augmentation de l'efficacité du procédé de combustion et la prolongation des périodes entre les ravitaillements en combustible dans les unités modernes ont été réalisées en exerçants une surveillance et un contrôle accrus sur la combustion. Il en est par contre résultée l'augmentation des possibilités d'accumulation de créosote. Cela aurait pu se traduire par un plus grand nombre d'incendies dans les cheminées et dans les maisons, et des dépenses pour les propriétaires et le public, pour avoir voulu économiser un combustible peu cher et facile à obtenir.

- ce qu'il en coûte pour chauffer l'eau et pour cuisiner est une source de préoccupation plus vive pour l'habitant moyen de Brabant Lake que le coût du chauffage des locaux. Dans le passé, une unité au bois a comblé ces trois besoins. Dans ces maisons "modernes", l'appareil qui sert à chauffer les locaux n'offre pas d'espace pour chauffer l'eau ou pour cuisiner. Il en résulte des coûts d'électricité élevés particulièrement lorsque le coût par kWh varie de 6 à 16 cents (en fonction de la consommation).

- les unités d'habitation équipée de systèmes à l'eau chaude où la température doit être maintenue au-dessus du point de congélation pendant toute l'année sont hors de prix pour les familles à faible revenu qui demeurent dans les collectivités éloignées où le coût de l'électricité est élevé.

- le niveau d'aide sociale qui peut être obtenu en vertu du programme du Ministère des Affaires Indiennes et du Nord du Canada ne convient pas aux habitants des unités équipées de systèmes à l'eau chaude, étant donné les coûts d'électricité plus élevés.

- certaines des prémisses utilisées actuellement dans l'établissement de "normes de construction" et de conceptions aux fins des programmes de construction de logements sociaux dans les régions éloignées devraient être réexaminées, et les habitants de ces maisons devraient être invités à expliquer leur "genre de vie" et leurs attentes. Les cuisinières au bois pourraient constituer une solution partielle aux coûts d'électricité élevés, mais les conceptions domiciliaires existantes rendront leur installation difficile.

En guise de conclusion, le rapport suggère aux Conseils et aux habitants de ces collectivités un certain nombre de mesures pour augmenter la sécurité du chauffage au bois. Parmi ces mesures, citons l'utilisation et l'entretien appropriés des appareils, et l'embauche par les Conseils d'un employé à mi-temps qui ferait fonction de chef des pompiers, afin de s'assurer que les mesures de prévention des incendies sont prises. Le rapport conclut également que les coûts d'électricité peuvent être réduits si les propriétaires utilisent des chauffe-eaux et des cuisinières au bois et il souligne que de l'aide financière est prévue pour les propriétaires qui désirent moderniser leur système au bois. Enfin, les auteurs mentionnent que les rencontres avec les membres des collectivités, lesquelles ont donné lieu à des échanges, auraient été vues d'un bon oeil. Le rapport recommande que des ateliers et des colloques publics soient tenus dans d'autres collectivités.

Cette étude a été effectuée par Bell, Ahenakew and Associates et le Saskatchewan Research Council pour le Conseil de la collectivités de Brabant Lake à l'aide d'une subvention du Programme de démonstration dans les collectivités éloignées d'Energie, Mines et Ressources Canada.

1. INTRODUCTION

1.1. The Community

Brabant Lake is a small community located 174 kilometers north of La Ronge, Saskatchewan on highway #102, on the banks of the Waddy River nears its confluence with Brabant Lake.

Prior to 1970, the settlement consisted of a few cabins along the lake shore, with a Department of Natural Resources (D.N.R.) two-way radio transmission facility as its centre. The construction of the mine access road to Gulf Minerals Uranium mine at Rabbit Lake in the late 1960's brought road access, and area residents who trapped along the Waddy River system began settling here.

In 1975, the Department of Northern Saskatchewan (D.N.S.) surveyed a town site and began construction of modern housing under its public housing program. The deisel electrical generating plant was installed, and a distribution system added in 1978, and a new school was built in 1979.

In 1983, approximately 140 people permanently reside in the community, occupying 27 units of living accomodation. Most families spend a portion of each year residing in their remote trap line cabins.

1.2. The Study

When this study was being planned, the local Council indicated the following concerns:

(a) Fuel oil costs were unaffordably high and there is no local delivery. Consequently, residents had made adaptations to their space heating systems to allow for wood-burning. Some of these adaptations posed a danger of house fires. The community had no fire fighting equipment.

The two central problems (danger of house fires and high electricity costs) which had been identified by Council, remained a major concern. Essentially what changed was our perception of the individual home-owners ability to resolve the problems, and a realization that he is a victim of circumstances over which he has had very little control.

It became clear that in order to effect positive changes, our message would have to be directed not only to the individual home-owners, but also to the various agencies whose programs and policies are responsible for the existing situation. This substantially broadened both the scope of the work-plan, and the focus of the information transfer aspect of the study.

Our data has been shared and discussed with home owners and the local government agencies in both target communities (Brabant Lake and Southend) and our educational program has been presented to the public, along with our conclusions and recommendations. Whether or not the Councils, or individuals will take action to address the problems identified will not be known until the commencement of another heating season. Indications from both Councils are favourable.

The process of conveying the relevant information to policy makers and planners was not included in the work-plan and remains to be done.

2. SUMMARY -SITUATION ANALYSIS

The following is a synthesis of facts related to local energy consumption gleaned from a house to house survey conducted in the community, supplemented by information obtained through consultation with local residents and officials of various government agencies. Detailed discussion of field work is appended.

2.1. Housing -

(Our survey, and subsequent consultation, gathered information on the 21 houses constructed since 1975 under a federal/provincial public housing program. The six other occuppied units include teacherages, staff housing trailers and one log cabin still in use. All references below are to the 21 public housing units only.)

All housing is relatively new, and has been constructed (generally) in accordance with the codes that were in effect in the year of construction. All units are equipped with oil-fired, forced air furnaces. Those built before 1978 all have problems of air infiltration and condensation. Residents of these homes have made their own adaptations to aviod using oil for space heat.

The Valley Comfort space heater has been most commonly used, but tin heaters, or tin stoves are in use in at least 6 units.

Units built since 1978 are equipped with combination wood/oil forced air furnace. Oil is rarely used.

Units built since 1980 have water pressure systems and sewage holding tanks.

Occupants of public housing have signed a mortgage agreement with C.M.H.C./Sask Housing Corporation whereby 25% of their income is required as a mortgage payment.

2.1.1. Problems:

(a) There are many complaints about the pre 1978 housing. It is drafty, and condensation has caused interior deterioration.

(b) Two of the three units equipped with water pressure systems are vacant because of the high cost of utilities (mainly electrical).

(c) Chimneys in the pre 1980 units are considered inappropriate for the continuous use of solid fuels.

(d) "Life-style" has not been taken into account in the design of housing units.

(e) Forced air furnaces and space heaters do not provide a surface for water heating or cooking. Occupants are forced to use electricity for these purposes. The exceptions are the four units who have equipped themselves with a wood fired, tin cook stove.

(f) Occupants regard themselves as tenants of government housing, not home-owners. This perception inhibits the willingness to invest in energy conservation or even safety measures which would enhance the value of their home.

(g) The settlement is not well prepared to deal with chimney or house fires.

2.2. Energy Consumptions and Supply (see Appendix II)

2.2.1. Fuel Oil

Teacherages, staff trailers and the store residence regularly use fuel oil. Only a few of the occupants of public housing units occasionally use oil, due to its high cost, (1.7453/gallon Dec. 1983) and difficulties associated with supply. (Hauled from La Ronge or Southend in 10-25 gallon quantities since there is no local delivery).

2.2.2. Fuel Wood

The principal source of heat energy for all public housing units is fuel wood. Wood harvesting is marginally mechanized (usually chain-saw and snow-machine) and is generally a "spare time" activity.

Virtually all fuel wood is currently harvested from within 3 km. of the settlement, from dry-standing spruce and pine killed by fire in 1960. The utilization of this very dry wood has resulted in a low incidence of chimney fires. The supply is rapidly dwindling however, and the addition of significant quantities of green wood to the fuel mix, is immenent.

Although harvesting practices might be considered inefficient, proximity and ease of handling result in very low costs (excluding labour - see appendix II). Landed fuel wood costs about $10.00 /cord (Winter 1983-84)

HOTCAN Computer Analysis indicated annual average consumption of wood at 10-12 cords. Local estimates of $100.00 for annual heating costs confirm the computer analysis.

About 75% of the wood burning equipment in use is "state of the art" technology and considered efficient in terms of fuel consumed and length of burn. Our research indicates that these alterations to the burning process, in the interest of convenience of operation, and conservation of fuel, result in an increase in creosote build-up. However, no significant problems have resulted in Brabant to this time.

The remaining 25% of the wood burning equipment is the less efficient tin variety. No problems have so far been associated with these units. Rather, they present the advantage of providing a surface for water heating and cooking.

2.2.3. Electricity

All units are served with electrical power. Electrity is diesel generated.

The residential rate schedule includes a strong financial "dis-incentive" in an effort to restrict consumption due to limited generating capacity.

Residential rate -effective July 1983.
Monthly base - $4.65
plus $.0398 for the first 315 kwh/month
plus $0.19 for any additional kwh/month

Some occupants of new housing are receiving power bills in excess of $150.00 per month in winter, due to the necessity to heat water and cook food with this expensive energy source.

2.2.4. Energy Consumption and Supply Problems - Brabant Lake

(a) Despite the existence of oil-fired heaters in all units, oil heat is not considered a viable option due to cost and supply problems.

(b) Easy, inexpensive access to excellent fuel wood is going to end over the next 3 - 5 years. The addition of green wood to the fuel mix will result in a higher incidence of chimney and house fires if preventive measures are not taken. Residents are generally not familiar with this problem.

(c) There is virtually no potential in this cash-short local economy, for a commercial wood-harvesting enterprise. There is however, an urgent need to organize the harvest to ensure an adequate supply of seasoned wood as available dry wood supplies diminish.

(d) There is a shortage of local expertise in the operation and maintenance of modern wood-burning equipment, and in the causes and control of chimney fires. The "modern" equipment is as much cause for concern as the older, less "efficient" tin heaters.

(e) Home-owners are being forced into an unacceptable cost-squeeze by a public housing program which demands increased electrical consumption, and a public utility which financially penalizes customers consuming more than minimal amounts of electricity. The options available to home-owners are limited.

2.3. Energy Cost Subsidization (see appendix III)

Only one household head reported full time salaried employment. All others obtain cash income from a combination of trapping, seasonal employment, and transfer payments.

Most residents are treaty Indians, eligible for Band administered social assistance. That portion of assistance included to cover utilities costs has been established on the basis of occupancy of Band housing, whose entire energy requirement is met with wood. Thus $55.00 per month is added during winter months. Provincial entitlement is $225.45 per month in winter.

With local fuel wood costs being low, this money is generally used to pay power bills. However, no provision is made for the fact that Brabant housing consumes much more electricity than Band housing on reserve. Treaty residents in Brabant receiving social assistance get much less help in meeting high energy costs than non-treaty residents.

3. INFORMATION TRANSFER

3.1. Objectives

The purpose of the study was to design educational materials which could be used in work-shops and seminars to make residents of remote communities aware of safe and efficient means of obtaining heat from wood.

To this end, a series of three information sharing meetings were held in the settlement, plus one workshop open to residents of both Brabant Lake and Southend.

Materials were designed around the principal concerns of Council, as expressed when the program was being planned:

(a) The danger of house fires

(b) The high cost of electricity.

In addition, the study team attempted to address those problems which had been identified in the process of collecting data, the solutions to which were within the scope of influence of either the individual home owner, or the local council.

3.2. The Materials

3.2.1. The Slide Sound Presentation

The slide/sound presentation was prepared with both English and Cree sub-titles and text (see English Text - Appendix IV).

Conceptually, it was intended to present a summary of the information in its "cause and effect" relationship. In actual presentation, this would be followed up by a more detailed discussion of each of the following points:

(a) Using wood as a heat source has been common practice (virtually uninterupted) in the north for hundreds of years. What has changed in the past decade is the applied technology. The changed conversion technology presents a unique series of problems. Northern home-owners need to be made aware of these problems, and how to cope with them.

(b) The causes of chimney fires and how to deal with them.

(c) Preventing chimney fires from becoming house fires.

(d) The reasons for high electrical costs and what might be done about them.

(e) How co-operative action, co-ordinated by Council, might reduce energy costs and the danger of serious house fires.

The slide sound presentation would be repeated at the end of the workshop, for re-inforcement. The hand-out materials would be left with the participants for future reference.

In the process of compiling slides and text, and presenting the first draft at a community workshop, we learned the following:

(a) In this, and presumably other remote communities, it is important to impact to present the information in the local language. It is more readily understood and appreciated.

(b) Much of the information was new information to the participants. This would seem to underscore the need to conduct this type of program in other remote communities where wood energy is used and incidence of house fires is relatively high.

(c) Our first - draft presentation could be made much more effective with some professional input. While both the text and the accompanying visuals seem to convey the desired message, the presentation requires improvement in timing (it tends to drag at times) and vocal presentation (poor quality sound recording - not enough pizazz to the intonation).

(d) The seasonal timing of workshops and seminars is critical to impact. Ideally, they should be held in the late fall (mid September to early December) when home heating and fire safety are imminent concerns. Our workshop was held in Mid April. The heating season seemed a long way off.

3.2.2. Hand - Out Materials

Text for a series of six hand-out pamphlets have been prepared, and distributed in draft form at the Brabant/Southend Workshop. (see Appendix V).

Chairpersons of the two municipal Councils attending the workshop, made the following comments:

(a) the material is easy to understand, and nothing would be gained by having it translated into syllabics.

(b) they would like to have the workshop repeated in the fall, when home heating is on people's minds.

(c) they would be reviewing the material with their Council with a view to implementing some of the recommendations.

We believe that the pamphlets should be professionally printed, with visuals incorporated which illustrate their relevance to northeners.

3.2.3. Display Materials

The Saskatchewan Research Council has collected a variety of display materials, published by wood-heating hardware manufacturers, which are intended to provide illustrations of the following points:

1. Green wood produces more creosote.

2. Controlling the combustion process.

3. A suitable cook-stove designe.

4. The structure of a heat resistant chimney.

In addition, pamphlets on programs of assistance for energy conservation measures are available for distribution, including: C.O.S.P., R.R.A.P., and ENERWISE. Northerners are generally not aware of these programs, and at the workshop, expressed considerable interest in their eligability.

3.3. The Workshop

The workshop was held in Brabant Lake on a warm, sunny evening in mid-April.* The purpose was to field test the draft materials and take suggestions on how the final versions might be improved.

Warm weather resulted in lower than anticipated attendance (about 20 people - many of them children). Those attending were primarily interested in seeing themselves on the screen. The slide sound presentation was consequently run through four times. Question period was dominated by a non-native participant, and local people offered few questions or comments on the material content. Some interest was expressed on the availability, cost and design of wood fired cook-stoves, but we were ill-prepared to provide definative answers. Interest was also indicated, in the programs that offer financial assistance. No suggestions were made on how the materials couid be improved.

Representatives of the program proponent, the Settlement Council, were generally pleased with the product. The impact of the work done under this program cannot yet be measured.

*1984

4. RECOMMENDATIONS AND CONCLUSIONS

Our recommendations and conclusions fall into three catagories:

(a) Summary of observations and suggestions which should be brought to the attention of public agencies whose policies and practices have such a dramatic impact on life in remote, economically dependent, communities.

(b) Summary of recommendations with respect to actions which could be taken by home owners and/or local government Councils to address the specific problems identified at the beginning of the study.

(c) Recommendations on how the process of information transfer might be effectively continued.

4.1. Observations - Impact on remote community energy consumption and fire safety, of public agency policy.

Most northerners have opted to live in communities with access to services such as electricity, treated water, and schools, rather than subsist in trapline cabins. A great number of factors have contributed to that decision, not the least of which has been the availability of "modern" housing, provided through public housing programs.

The underlying economic rationale for public housing programs has been the observed relationship between adequate housing and the health and social well - being of the population.

There is some danger that the implementation of well intentioned public housing programs, in the absence of any input from end-users, will defeat their admirable purposes. For reasons primarily attributable to energy costs, there are modern units of housing standing vacant in communities where housing is generally overcrowded, and several residents talk about moving out of their homes and building log cabins.

The following are some of the issues observed or identified in the community of Brabant Lake, the resolution of which will have a bearing upon the energy related concerns of this study.

4.1.1. The validity of the "mortgage" approach to the recovery of capital construction costs. This issue has many ramifications, but the most serious from an "energy" perspective is the refusal of the housing authority to undertake conservation or safety related retrofit actions. The "home-owner", who regards himself as a tennant, is also reluctant to spend his limited resources to enhance the "market value" of a home for which there is no market.

Because most northern home-owners are in arrears in mortgage payments, they are ineligible for some programs of financial assistance to make home improvements, such as R.R.A.P.

4.1.2. The Utilities Cost Squeeze

Modern housing consumes more electrical power. The supply of electrical power, in diesel communities, is limited.

To limit consumption, the electrical utility applies a financial penalty to high volume consumers. Without taking this fact into consideration, designers of public housing force the consumption of high volumes of electricity by virtually removing the option of using wood as an energy source for water heating and cooking. The result is power bills which make the most modern homes unaffordable.

4.1.3. Expensive Measures to Conserve an Inexpensive Resources.

Two observations related to this phenomenon are typical of the consequences of applying "inappropriate" technology.

Wood burning equipment manufacturers have, in recent years, designed equipment that recovers maximum energy per unit of fuel wood. The trade-offs have been increased complexity and requirements for maintenance and the enhanced probability of creosote build up. Both conditions increase the danger to northern users. This trade off may be valid in areas of the country where wood is in short-supply and expensive. But in most remote communities, where wood is readily available and inexpensive, the economy of operation is a questionable trade off for safety.

Based on the premise that energy, from whatever source, is costly and should be conserved, consideration is being given to incorporating stringent "air tightness" specifications into the northern building "standards".

There is some evidence which suggest that "liveability" is negatively affected by the air-tight design. Certainly construction costs are increased, allowing fewer units to be constructed from limited financial resources, in an area of critical need. And all for the purpose of conserving a resource that is, in most northern communities, inexpensive and available.

Housing design which took advantage of the availability of an inexpensive alternative energy source, particularly by reducing electrical energy consumption, would do much more for the well-being of residents of remote communities, and for the nation's off-oil objectives.

4.1.4. Conclusions

Resolution of the problems identified above will be complex. There are obviously many relevant factors not included in our summary observations which require consideration. Each of the three issues might warrant a full scale study. However, some general conclusions can be drawn:

(a) Agencies identified should be made aware of at least these consequences of their programs.

(b) Agencies responsible should undertake end-user consultation prior to the implementation of policy or program changes in order to mitigate negative consequences.

(c) Some immediate action should be taken to relieve northerners of the high cost of electricity.

4.2. Recommendations and Conclusions Regarding Home and Community Fire Safety and High Electrical Costs

All of these recomendations are included in the "hand-out" material appended (See Appendix V). In summary, they are:

4.2.1. Safety and efficiency are improved if wood-burning equipment is properly operated and maintained.

4.2.2. Home-owners can take steps to reduce the probability of chimney fires, and in containing those that do occur.

4.2.3. Electricity costs can be reduced if home-owners use wood-fired cook stoves and water heaters.

4.2.4. Some financial assistance is available to home-owners who might wish to add-to or up-grade their wood-burning equipment.

4.2.5. Councils should consider employing a part-time "fire-chief" to ensure fire safety measures were being taken.

4.2.6. Brabant faces a unique situation with respect to the availability of a supply of seasoned wood, and steps should be taken to assure a continued supply.

4.3. Recommendations on Information Transfer

Until recently, northerners have not had a great concern for energy conservation since they consumed relatively little. Wood has been the main energy source, and it has been inexpensive.

Along with other Canadians, although sometimes from a different perspective, they are showing increased concern, as urbanization forces higher consumption of more expensive fuels.

Their exposure to high technology has been brief, and their expertise in coping with it therefore lags behind that of the general population.

Residents of Brabant Lake maintained a high level of interest in the findings of our study throughout the heating season. Much of the information shared at community meetings was new information to participants (the actual cost per kwh of electricity, the fact that there was a penalty applied to large consumers, the fact that using green wood increases the probability of chimney fires, the fact that financial assistance programs are available to help resolve energy problems, etc.).

Relative isolation, inexperience with the technology, and the language barrier inhibit information transfer by traditional methods.

All of our meetings were conducted in Cree, with an interpreter providing assistance to the non-native participants. This contributed significantly to maintaining the level of interest and getting our points across. While it did not really get a fair test, we believe that a highly visual approach to technical information transfer is the only one that will have lasting impact.

We conclude that there are a great many remote northern communities who share concerns for energy related matters with the people of Brabant Lake, and who could potentially benefit from participatory work-shops and seminars.

We recommend that a series of mini-projects be undertaken that would follow the following pattern:

(a) Meeting with Council to identify specific energy related concerns.

(b) Several days of data collection relating to these concerns.

(c) Public meeting to confirm the validity of the data.

(d) A follow-up public meeting to visually present the findings and illustrate the recommendations.

We would anticipate that the concerns which would be identified would be quite similar from one community to the next, and that much of the material prepared for this project could be appropriately used. However, it is important that the participants have an active role in identifying the problems, and working through to the solutions.

Workshops should be held in late fall/early winter. Oral presentation of data and recommendations should be in the local language. This would require that the workshop co-ordinator identify and work with a local spokesperson to familiarize him/her with the technology.

It is anticipated that each workshop would require from five to ten days of co-ordinators time, depending on the degree to which concerns identified locally were similiar from one community to the next, and the availability of the relevant data.

The broad objectives of these "mini-studies" would be to raise the level of awareness of:

(a) the safe and efficient use of wood as an energy source,

(b) the potential for economizing on energy expenditure.

Since northerners will use wood as a main energy source, and they are generally unfamiliar with current technology, they are at higher than normal risk from house fires. In our view, this would be the primary motivation for continuing the information transfer process. The "off-oil" objectives would potentially be met by enhancing the probability that oil consumption for both space heat and electrical power generation would be further reduced.

APPENDIX 1

Housing, Brabant Lake, Saskatchewan, December 1983

The following information on housing in Brabant Lake was obtained from the staff of the Saskatchewan Housing Corporation in the course of compiling data for the HOTCAN Computer Analysis. This information is supplimented by data gathered by the Gideon McLeod family in a house to house survey conducted over the period Nov.10 to Dec. 9, 1983. During the survey period, eight of the public housing units were unoccupied. In most cases, occupants were out in trapline cabins. Two units were vacant and boarded up. Questionnaires were completed on eleven public housing units.

1.1 Housing:

New housing, constructed under the C.M.H.C./Sask. Housing public housing program, was built to C.M.H.C. "building code" standards that were in effect at the time. For example, the units constructed in 1975 were insulated to R-13 ceiling and R-12 walls. Although residents indicated a strong preference for wood-fired heating systems, none were C.S.A. approved at that time, and oil fired units were installed. Chimneys were 7" "Selkirk" type which since have been designated unsuitable for solid fuel heaters.
A large proportion of the local units were built in 1976 (ten). Once again, no C.S.A. approved solid fuel units were available, and oil-fired units were installed. D.N.S. however, acknowledged the wishes of the residents and installed a second chimney (again a 7" Selkirk type) and recommended that residents install a Valley Comfort wood-fired space heater in the living area. These units were better insulated (R-20 ceiling and R-12 walls) and better sealed, but condensation caused serious problems, and high levels of infiltration are now common.
By 1978, Intercity and Enterprize had obtained C.S.A. approval for wood/oil combination forced air furnaces, and all nine units constructed since have these installed. These units are also better insulated (R-30 ceiling, R-20 walls, triple glazed windows, wood solid core exterior doors and storms, wood window casements, etc.), well sealed and ventilated.
Wood is used almost exclusively as a heat source in these units, and residents consider the furnaces efficient and

relatively safe, although concern has been expressed about the newer models that lack a manual damper control.
Five units have fresh water holding tanks, electric water heaters, pressure systems and septic tanks. Holding tanks are filled by hose running from the school. Three of these new units are vacant.
Domestic fresh water, for all other units, is hauled by pail from the school, which pumps its water from a well, or from the river. Three bedroom houses built since 1976 have a full or half basement constructed of treated plywood, insulated, with a heated, sealed sub-floor space. All other units have a heated crawl space.

1.2 Space Heat:

All of the Public Housing units, the teacherage and the three trailer units are equipped with oil-fired, forced air furnaces. In the winter of 1983/84, only four private homes have used oil to suppliment space heat. (The teachers duplex and other government units also use oil.)
The survey indicated only one unit using a small quantity of propane, and that was for cooking rather than space heat. Wood is the main heat source in all cases. None of the households surveyed admitted to using electricity to suppliment heat, although it is fairly common in most northern communities to take the morning chill off the living area by turning on the hot plate or opening the range oven door.
Nine of the 21 Public Housing units have been built since 1978 and have had wood/oil combination furnaces installed. Residents have made their own adaptations to avoid using oil in the balance of the units. In most cases, the type of unit installed has been the Valley Comfort space heater, installed in the " main level " living area.
Four of the 11 units surveyed used the so-called " airtight " tin heater as the principal source of space heat. Two of these were " tin cook stoves " and also served as a source of heat energy for food preparation. It is locally estimated that a total of six air tight tin heaters or stoves are in regular use.
Only three of the units surveyed had a fire extinguisher on the premises.

1.3 Water Heat:

Only two of the surveyed units had electric hot water heaters, and water pressure systems. Occupants of these units, plus the teachers residing in the Teacherage, and the occupants of trailers bathe or shower at home. Most other residents use the facilities at the school.
The school has also offered the use of its laundry facilities if the community will purchase the washer/dryer units. This has currently not been done. It is locally estimated that 3/4 of the households have their own electric washer. Water for laundry is heated on tin stoves if one is in use, or on an electric range of hot plate if not.
Hot water in small quantities for dishwashing, tea, etc., is heated on a wood stove (tin heater) in two of the 11 homes surveyed. In all other cases an electric "pot" (kettle) is used.

1.4 Food Preparation:

In all but two reported instances, food is prepared on electric stove or hot plate. The survey found that two families are using the tin cook stove for food preparation.

1.5 SUMMARY - DOMESTIC ENERGY CONSUMPTION:

Local expenditure on home space heating is minimal with most units obtaining heat from relatively efficient wood fired forced air furnaces or "Valley Comfort" type space heaters. Only about 25% of the occupied residences are using the less efficient tin heaters. These are used primarily for water heating and cooking, but also to suppliment space heat. We estimate that only two or three units are relying on the tin heater as a main source of space heat.
A higher than necessary proportion of household income is being spent on energy for water heating and cooking with the large majority of households using expensive electrical power for these purposes. Despite its problems, the tin stove can be used for all of these purposes.

It is significant that 3 of the 5 units with full plumbing facilities are vacant. Total energy costs in those units are much higher, and that is considered the main reason for the high vacancy rate.

1.6 HOME OWNERSHIP:

It seems appropriate to comment briefly on home owership here because of the particular situation in Brabant.
The great majority of families are Treaty Indian, and if they were living on reserve, would be eligible to be provided with band owned housing. While band owned units are generally much smaller (usually 800 square ft. with no basement), equipped with only a wood fired space heater, and less attractive, the householder is faced with a once only payment of $600.00. He then occupies band owned housing "rent free". He cannot sell his unit and must vacate if so ordered by his landlord (the band).
At least 85% of the housing in Brabant has been constructed under the S.H.C/C.M.H.C. public housing program. The value of each home is determined by the actual cost of construction, plus a percentage for administration. The home owner enters into a mortgage agreement with S.H.C. to repay costs over a 25 year period. Monthly payments are set at 25% of householders income, and subsidized by the Federal/Provincial program beyond that amount.
The occupant has equity, and can presumably sell his unit, although the market is infinitesimal.
Villagers do not see any hope of paying off their mortgage. They regard themselves as tennants in S.H.C. owned housing. They face a dilemma. With full time employment, the 25% mortgage payment is regarded as punitive. When they are unemployed, the D.I.A.N.D. social assistance levels are insufficient to cover the higher cost of utilities in these larger units. The units with water pressure systems, which must be kept from freezing, and electric hot water tanks, are prohibitively expensive, and most are consequently unoccupied.
Sask. Housing Corporation has negotiated a blanket insurance policy for all of its 1,600 units in the north. Premiums are relatively high for northern units since fire fighting facilities are scarce. Rates vary by community. Insurance premiums, as well as taxes , are added to the annual mortgage payment, and are borne by houseowner in cases where his income level is sufficient to meet them. If not, premiums are paid through the Federal Provincial public housing program. The policies carry a $200 deductable clause which must be paid by the registered occupant.

Appendix 2

Energy Supply and Residential Consumption, Brabant Lake, 1983-1984

2. ENERGY SUPPLY

2.1

Survey responses to questions related to fuel supply were very consistent.

All respondents cut and haul their own firewood from within a 2 mile radius of the village. All but two indicate that wood is cut with a chainsaw and hauled by snow-machine (two respondents indicate they use only an axe and hand saw. Two others indicate that they occasionally use a half-ton truck to haul wood).
All respondents are using firekilled spruce or pine, either dry standing or fallen. No one buys firewood.
The survey indicated that only four households occasionally use oil to suppliment home heat, and they haul their own in 20 to 45 gallon quantities. The high estimate of the annual expenditure on fuel oil is $100. The local estimate of the annual expenditure on fuel wood ranges from $50.00 to $100.00 per year.
Local estimates of annual cost for electricity is much higher; ranging from a low of $400.00 to a high of $1,500.00 with the average estimate being approximately $1,000.00.

2.2 Fuel Wood Costs

In order to obtain cost figures for fuel wood harvesting at Brabant Lake, the study team, with the assistance of two young men from the community, used chain saws and snow machines to fell, limb, buck to cord length, and haul one cord of wood on Dec. 13, 1983.
A stand of old fire killed, very dry pine and spruce located 3.2 km. down the lakeshore from the Gideon McLeod residence was used. Access to the stand was by lake ice, and by a 600 metre rough trail cleared into the old burn area. Another 100 metres of trail was cleared to gain access to the stand that was chosen for cutting. The trail was cleared with an axe.

Trees were felled, limbed and bucked using a Pioneer P-26 14" chain saw. Wood was hauled back to the community with 2 snow machines pulling home-made sleds.

Costs to cut and haul 1 cord of dry wood:

CHAIN SAW:		
gas - .375 litres @ $.424 =	$0.16	
2 cycle oil- .0234 litre @ $3.50 =	$0.08	
chain oil - .15 litre @ $1.99 =	$0.30	
Total chain saw -	$0.54	$0.54
SNOW MACHINES:		
Machine #1:		
gas - 5 litres @ $.424 =	$2.12	
injection oil-.210 litres @ $5.69 =	$1.19	
Total snow machine #1 -	$3.31	
x two machines =	$6.62	$6.62
Total machine costs =		$7.16

Total distance travelled (2 round trips) - 13 km.
Total time required: 4 persons @ 2 hrs.30min.= 10 man hours
Snow machine operating time: approximately 2 hrs.
Chain saw operating time: approximately 1 1/4 hrs.

Amortized hourly cost of snow machine and sled:
$2000 (approximate capital cost)/4000 hrs.
(approx. life expectancy) = .50 per hr. x 4 hrs = 2.00

Amortized hourly cost of chain saw - $250.00
(approximate capital cost)/ 2000 hrs.
(approx. life expectancy) =
0.125 hrs. x $1.25 = $0.16 $ 0.16

$ 2.16

Maintenance cost (snow machine and chain saw) @ $0.20 per hr. x 3.25 hrs. = $0.65

$0.65

Summary of costs:

operating costs (machines): $7.16
amortized costs (machines): $2.16
maintenance costs(machines): $ .65
TOTAL EQUIPMENT COST : $9.97 -- to cut and haul 1 cord of dry wood

Man Hour Costs:

It is difficult to attribute a cost to "labour" for this activity since it is often performed by school kids on weekends, or is generally a "spare time" activity. Time spent collecting fuel wood is generally not time taken from other productive economic activity.
A lot of time was also used up on this occasion by measuring and stacking in order to determine that we had cut exactly one cord.
Subject to ratification by the community, we are suggesting that it would take 2 men 4 hours each to fell, limb, buck, load, and haul one cord of wood from within a radius of 3 kms of the settlement. (8 man hours). At a minimum wage of $4.00 per hour this would add $32.00 to the cost of a cord of wood, for a total cost of $41.97 per cord. (If labour is discounted, and if the average home consumes about 12 cords of wood per year, the survey estimated average expenditure on fuel wood of $100. is very close - 12 x 9.97 = $119.64).
Professional loggers, clear cutting a burn area south of La Ronge, using mechanical log skidders and large trucks, are currently making a profit selling cord wood length fuel wood at $45.00 per cord.
Prince Albert Pulpwood estimates the cost of pulp logs landed at the mill site at Prince Albert at $55.00 per cord.

2.3 ELECTRICITY COSTS

North Sask. Electric report the following electrical power consumption:

A.

Year	#Residential Hookups*	Average Monthly Consumption
1978	13	301 kwh/m
1979	17	292.8 kwh/m
1980	18	368.9 Kwh/m
1981	18	442.9 kwh/m
1982	17	425 kwh/m

*(These figures do not include teacherages.)

B. November 1983 - Residential Electrical Consumption Range -

Low 14 kwh/m
High 710 kwh/m

For November 1983, the high electrical energy consumer, at 710 kwh. would have an electrical bill of :

$ 4.65 basic
12.34 for first 315 kwh.
75.05 for the balance

$92.24

The difference between highs and lows can be attributed to heating water and preparing food using electrical as opposed to wood, as an energy source.

July 1983 Monthly Basic Rate - $4.65/m

- plus $0.0398 for first 315 kwh/m

- plus $0.17 per kwh for any additional

2.4. LOCAL FUEL WOOD INVENTORY:

Reference to the Northern Reconnaissance Forest Survey Map attached, or a visit to the community, reveals that the community of Brabant Lake is situated within the bounds of a very large old "burn". Provincial Forestry Branch records on this particular burn have been placed in archives, and none of the present branch staff were able to identify the year of the burn. Local residents however, suggest that it occurred in 1960.

It is the larger diameter spruce and pine which were left standing after this burn which are currently being used as fuel wood. Twenty-four years of "seasoning" has left this firewood very dry, and dry rot is effecting an increasingly large proportion of each tree.

Each occurrance of high winds must further reduce the number left standing. Fallen material quickly becomes water soaked and useless as firewood.

New growth (marked " R " - regeneration) is predominantly birch, aspen, and shrub, less than 10 metres high and a dbh of less than 12 cm. Pine and spruce are scattered throughout this new growth and are less than 5 metres high.

None of the wood in the regenerating areas has reached a level of maturity that would make it suitable for fuel wood. As nature takes its course, we would have to assume that the quantity of dry standing fire killed spruce and pine, from a 24 year old burn, will become more and more scarce. Since regeneration has not yet provided an alternative source, and because the burn was so extensive, obtaining a supply of fuel wood will become a more significant problem than it has been.

Air photo analysis revealed a few patches of mature forest that was skipped by the 1962 fire. Several of these are on rock outcroppings, where growth characteristics are poor, and stands of jackpine are scattered. Those outlined in green on the accompanying map were identified as potential fuel wood source locations.

We have attempted to identify those mature stands to which relatively easy access can be gained by road, trail or lake ice, within a 3 km. distancee of the village.

In our judgment, if only mature trees are harvested from within this radius, fuel wood will be in short supply within 5 years.

2.4.1. Implications of Diminishing Fuel Wood Supply

For the past 15 years or so, residents have had an easy access to an excellent fuel wood supply.
Fire killed, dry standing pine and spruce:

- are light and easy to fell, limb, and carry from the bush.
- are very well seasoned, and while btu value per log may be lower, they do not cause creosote build-up when burning. This would account for the very low incidence of chimney fires experienced in the community.
- costs, of both human energy and equipment are lower since clearing access trails, sawing , and hauling very dry wood is relatively easy.

Over the next 2 - 5 years, this source of fuel wood will have to be supplimented or replaced by green wood. Harvesting costs will increase, and the incidence of housefires is likely to increase unless the community takes some preparatory steps.

2.4.2. Resource Ownership and Use Conflicts

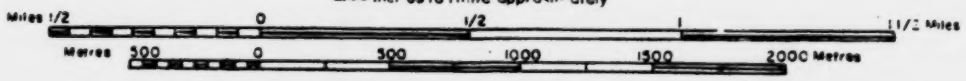
All land surrounding the corporate limits of the settlement, is crown land. Fire killed spruce and pine harvested from Crown lands within the province is subject to a " stumpage " royalty of 25 cents per cord. Since potential revenue would not cover the cost of administration in remote situations, royalties are generally not collected.
"Resources" staff indicate that, if the wood were being harvested for resale, they would attempt to collect royalties.
We have been unable to identify any plans to utilize the forest resource for commercial purposes in the Brabant area. Brabant is arbitarily considered to be beyond the "commercial forest" belt, and while there are pockets of merchantable timber, they are considered too far from market to be of commercial value.
Forest fire protection service is accordingly provided .
Over the long term (25 - 50 years) regeneration will much more than compensate for any anticipated wood harvest from

the area.
A "Sask Power" study indicates that even if the forest were used for conversion to electricity through gasification; to meet projected energy demands, there would be a more than adequate supply.
The settlement is located on sloping ground between a ridge at 1,350 ft. above sea level 3/4 km. to the west and the lake at 1,185 ft. A.S.L. 1/4 km to the east. Prevailing westerly winds prevent any deleterious effect on air quality as a result of wood fired space heating. It is considered unlikely to become a problem even if the settlement should experience a significant increase in population.

NORTHERN RECONNAISSANCE FOREST SURVEY

SCALE 1:25,000

2.53 inches to 1 mile approximately



MAP REFERENCE

Improved Road		Height in feet above sea level	1925'
Unimproved Road		Building or cabin	
Bush Road or Trail		Aerial Photograph center	61-12
Railway		Provincial Forest Boundaries	
Intermittent Stream		Indian Reserve Boundaries	
Rapid or Falls	Falls 5'	Fire Tower	

FOREST REFERENCE

SPECIES ASSOCIATION

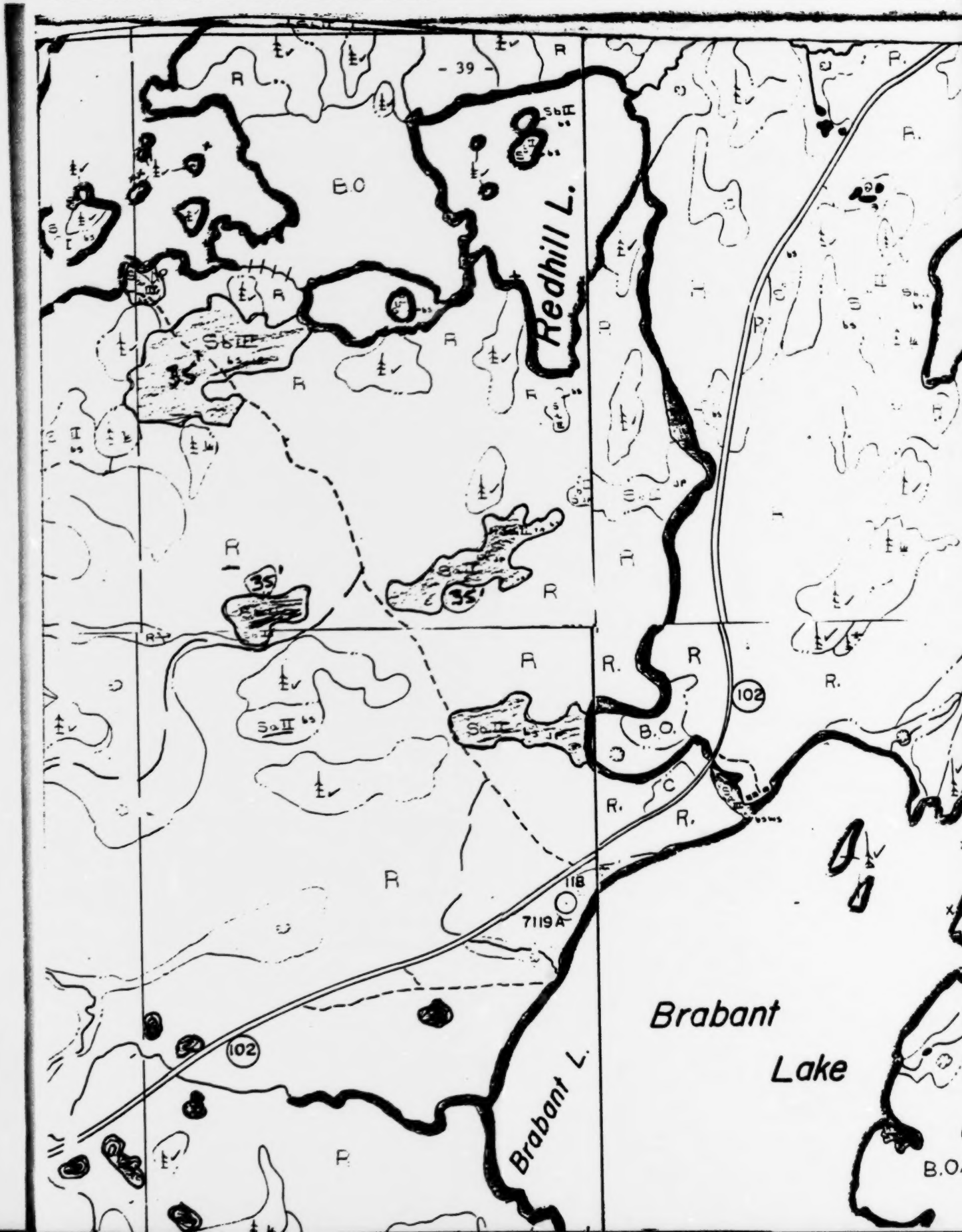
Softwood (over 75% softwood)	S
Mixedwood (50 - 75 % softwood)	SH
Mixedwood (25 - 50 % softwood)	HS
Hardwood (less than 25 % softwood)	H
Regeneration (all species less than 5 metres in height)	R

CROWN DENSITY CLASS		*HEIGHT CLASS*	
10 % to 40 %	a	Up to 5 metres	R
40 % to 70 %	b	Over 5 to 10 metres	I
70 % to 100 %	c	Over 10 to 15 metres	II
		Over 15 metres	III

SPECIES (when identifiable)

White Spruce	wS	Tamarack	tL
Black Spruce	bS	Trembling Aspen	tA
Jack Pine	jP	Black Poplar	bPo
Balsam Fir	bF	White Birch	wB
Marsh, open muskeg		Treed muskeg	
Clear rock		Treed rock	
Clear sand		Treed sand	
Clear cut		Brushland	
Meadow		Recent burn	B
Flooded area		Clearing	c

Forestry information compiled and drawn by the Saskatchewan Forestry Branch from aerial photographs taken in **1975**


- 39 -
Redhill L.
B.C
Sb III
35
R
Sa II
102
B.O.
C
118
7119A
Brabant L.
Brabant
Lake

2.5. SUMMARY OF FINDINGS:

At the time when this study was being conceptualized in consultation with the local council, the Consultant formulated a series of assumptions regarding local energy concerns:

- local ultilization of inexpensive but unsafe " tin heaters ", inappropriately installed was common.

- consequently, the community suffered a high incidence of house fires.

- fuel wood harvesting techniques were inefficient and therefore the cost of fuel wood was high.

- that by demonstrating that current space heating practices could be improved upon, in terms of economy, safety, and convenience, we could convince residents to convert from tin heaters to modern, high efficiency, space heating units.

- that Brabant was typical of dozens of remote northern communities, and the process of demonstrating the wisdom of our thesis, could be applied in many other communities.

Upon detailed examination of the energy consumption situation, we have found:

- approximately 1/2 of the housing stock in Brabant (constructed since 1978) is comparable in quality to that found in most urban centres. The balance is drafty and difficult to sustain at constant temperatures due to designs inappropriate to the lifestyle.

- wood fired space heating equipment in use is generally modern and efficient. " Tin heaters " are used in fewer than 25% of the units surveyed.

- the ready availability of fire-killed, dry, standing fuel

wood has resulted in very low harvesting costs, and because it is very well seasoned, a very low incidence of chimney fires.

- Brabant is unique in having such easy access to an excellant supply of fuel wood, and a low incidence of fires.

- Fuel wood cost to consumers is very low. (In the range of $10 per cord if the labour factor is not added in, and we have detailed some justification why it should not be.)

We have instead, identified a broad range of additional problems:

- the availability of well-seasoned wood will quickly diminish over the next 3 years, and will be replaced by fuel wood with a much higher moisture content.

- chimneys installed in the pre-1978 units are not adequate for continuous solid fuel use, and the potential for serious house fires occurring in these units over the next 5 years, is high.

- there may have been too much concern for energy efficiency in the selection of wood-burning furnaces and space heaters for the remote communities with ready access to a fuel wood supply. Increasing efficiency of the combustion process, and extending the periods between refueling in the modern units, has been achieved by better controlling and directing the burn. The trade-off has been an increase in the potential for creosote build-up. The result may have been a higher incidence of chimney/house fires, and the related expense to the home owner and the public in order to conserve an inexpensive and readily available fuel.

- of more critical concern to the average resident in Brabant Lake than the cost of space heat energy, is the cost of water heat and cooking. Traditionally, one wood-fired unit has served all three purposes. In these " modern " homes, the " space " heater provides no surface for water heating or cooking. The result is high

electrical service costs, particularly when the cost per kwh to the consumer ranges from 6 to 16 cents (depending on consumption).

- housing units with water pressure systems installed, which must be maintained at above freezing temperatures year round, are prohibitively expensive for low income families in remote communities where the cost of electrical power is high.

- the level of social assistance available through the D.I.A.N.D. program does not accomodate the occupants of units with water pressure systems, and subsequent higher electrical costs.

- some of the premises upon which " building standards " and design decisions affecting public housing programs for remote areas are being made should be re-examined with provision for end user input on " life style " and liveability.
Wood-fired cook stoves might be a partial solution to high electrical energy costs, but the existing housing designs will not readily accomodate them.

Appendix 3

Estimate of Current Energy Consumption - Computer Analysis

The following information is supplied in meeting the Saskatchewan Research Council's requirements and responsibilities in regard to the Brabant Lake wood heat safety project. (As per work statement in the agreement between Canada and Brabant Lake, Advisory Council).

1. Per Work Statement 2.2 (a):

SRC will make HOTCAN computer runs on house models with proper information filled out on designated forms by J.J. Bell to a maximum number of 4 houses. Predicted annual heating fuel consumption for these houses will be summarized and presented to J.J. Bell.

Required data for the HOTCAN runs was based on year of construction. The following breakdown and results of the computer runs are as follows:

House Type A (Year 1975)

General Description

- Toronto Split-Level (925 sg. ft living space).
- Insulated to R-13 ceiling and R-12 walls.
- Double glazed windows, insulated metal doors.
- Considered by occupants to be drafty around windows, doors, and electrical outlets.
- Uninsulated basement.

Predicted Annual Space Heat Energy Consumption

- Electrical consumption - 44884.74 KW.h
- Oil consumption at 70% eff - 5919 litres/1315 gals.
- Wood consumption at 50% eff - 19 chords.
  at 70% eff - 13 chords.
  range of wood consumption 13 to 19 chords.

House Type B_1 (Year 1976

General Description

- 3 bedroom (1,088 sg. ft.).
- Insulated to R-20 ceiling and R-12 walls.
- 2"x 6" P.W.F basement insulated to R-20.
- Double glazed windows, insulated metal doors.
- Considered by occupants to be drafty around doors.

Predicted Annual Space Heat Energy Consumption

- Electrical consumption - 22319.54 KWh.
- Oil consumption at 70% eff - 2943 litres/654 gals.
- Wood consumption at 50% eff - 10 chords.
  at 70% eff - 7 chords.
  range of wood consumption - 7 to 10 chords.

House Type B_2 and C (Year 1976-1977)

General Description

- 2 bedroom (896 sg. ft.).
- Insulated to R-20 ceiling and R-12 walls.
- Heated crawl space foundation.
- Double glazed windows, insulated metal doors.

Predicted Annual Space Heat Energy Consumption

- Electrical consumption - 25940.77 KWh.
- Oil consumption at 70% - 3421 litres/760 gals.
- Wood consumption at 50% eff - 11.3 chords.
  at 70% eff - 8 chords.
  range of wood consumption - 8 to 11.3 chords.

House Type D (Year 1978, 79, 80)

General Description

- 3 bedroom.
- Insulated to R-40 ceiling, and R-20 walls.
- 2"x 6" P.W.F basement insulated to R-20.
- Triple glazed windows.
- Exterior doors and solid core wood with storms.
- Considered by occupants to be tight and not drafty.

Predicted Annual Space Heat Energy Consumption

- Electrical consumption - 13249.84 KWh.
- Oil consumption at 70% eff - 1747 litres/388 gals.
- Wood consumption at 50% eff - 6 chords.
  at 70% eff - 4.2 chords.
  range of wood consumption - 4.2 to 6 chords.

Discussion of Results

- Heating Value of Spruce

  The following method was used to determine the heating value for a chord of spruce wood.

  - Density of spruce is 25 lb/ft^3
  - 60% to 80% actual volume in a cord.
  - 1 cord contains 128 ft^3 (4'x4'x8').
  - Therefore: a cord of spruce weighs between 1920 lbs. and 2560 lbs.
  - Heating value of spruce = 8890 Btu./lb dry.
  - Heating value of 1 cord of spruce at 2000 lb. and 12% moisture content equals:

$$\left[8890\ \left(\frac{1}{1+.12}\right) - \left(1-\frac{1}{1+.12}\right)\ 948\right] \times 2000$$

$$= \left[7938 - 102\right] \times 2000$$

$$= 7836 \times 2000 \text{ Btu}$$

$$= 15\ 672\ 000 \text{ Btu/cord (15.6 MM Btu/cord)}$$

- Occupant Estimated Consumption

Brabant Lake residents have estimated they use approximately 10 to 12 chords annually. This compares closely with the average HOTCAN predictions of:

11.6 chords at 50% eff.

8.0 chords at 70% eff.

- HOTCAN COMPUTER RUNS

Pages 5, 6, 7 and 8.

House Type A (Year 1975)

```
* * * * * * * * * * * * * * * *
*                               *
*        PROGRAM HOTCAN         *
*  NATIONAL RESEARCH COUNCIL    *
*        OF CANADA              *
*      DIVISION OF              *
*    BUILDING RESEARCH          *
*  SASKATOON, SASKATCHEWAN      *
*                               *
* * * * * * * * * * * * * * * *
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TE[illegible]
[illegible] = [illegible] 2.
BASEMENT = 20

SENSIBLE HEAT GAIN
FROM PEOPLE (kWh/d) = 0
DAILY BASE ELECTRIC
CONSUMPTION (kWh/d) = 14
DAILY HOT WATER
CONSUMPTION (kWh/d) = 14

MASS LEVEL CHOSEN IS <A>

WINDOW SHADING COEFFICIENTS:
SOUTH = .83 NORTH = 0.00
EAST = .83 WEST = .93
OVERHANG GEOMETRY:
WINDOW HEIGHT = 1.52 m
OVERHANG PROJECTION = .61 m
HEIGHT ABOVE WINDOW = .20 m

NATURAL INFILTRATION
RATE (AC/hr) = .3
FORCED VENTILATION
RATE (AC/hr) = 0

BUILDING PARAMETERS

ELEMENT	AREA m2	RSI m2-'C/W	U VALUE W/'C	HEAT LOSS	% SEASONAL	HEAT LOSS
CEIL.	86.0	2.3	37.5	12.34		
WALLS	116.4	1.1	109.8	36.10		
DOORS	3.0	.5	6.2	2.02		
BSMT ABV GR.	23.1	.4	65.7	21.59		
BSMT 600mm	16.4	.4	16.9	5.75		
BSMT TO FL.	25.9	.4	16.3	5.61		
FLOOR PERMI.	24.9	0.0	18.5	4.11		
FLOOR CENTRE	14.8	0.0	3.3	.74		
WINDOWS						
SOUTH	1.1	.38	2.9	.96		
NORTH	0.0	.00	0.0	0.00		
EAST	1.5	.38	3.9	1.28		
WEST	4.5	.38	11.7	3.85		
AIR CHANGES	.300 AC/hr	317.2 m3	29.4	9.65		

MONTHLY SUMMARY OF ENERGY CONSUMPTION

MONTH	TOTAL LOAD kWh/d	MONTHLY AVG HOURLY kWh/d	SOLAR GAIN kWh/d	FREE GAIN kWh/d	TOTAL CONSUMPTION kWh/d
JAN	281.0	.03	273.7	301.7	
FEB	249.3	.05	237.8	265.8	
MAR	207.9	.08	191.6	219.6	
APR	126.4	.13	110.0	138.0	
MAY	79.4	.22	54.8	82.8	
JUN	77.2	.38	23.2	51.2	
JUL	16.8	.64	6.0	34.0	
AUG	25.0	.48	13.6	41.6	
SEP	66.1	.19	53.8	81.8	
OCT	109.2	.08	100.1	128.1	
NOV	183.1	.07	176.9	204.9	
DEC	246.5	.02	241.2	269.2	

ESTIMATED ANNUAL SPACE HEATING
[illegible] 44204.74 kWh
[illegible] = 0%

House Type B1 (Year 1976)

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*                                   *
*        PROGRAM HOTCAN             *
*   NATIONAL RESEARCH COUNCIL       *
*         OF CANADA                 *
*       DIVISION OF                 *
*     BUILDING RESEARCH             *
*   SASKATOON, SASKATCHEWAN         *
*                                   *
* * * * * * * * * * * * * * * * * *

TYPE B1
PA

DATA IS FOR PRINCE ALBERT

18/1/84
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BUILDING PARAMETERS

ELEMENT	AREA m2	RSI m2-'C/W	VALUE W/'C	HEAT LOSS	% SEASONAL	HEAT LOSS
CEIL	94.9	7.5	28.4	15.84		
WALLS	94.1	2.1	44.5	24.86		
DOORS	3.3	1.2	2.6	1.47		
BSMT ABV GR	35.8	3.5	10.2	5.67		
BSMT 300mm	25.3	3.5	5.9	2.24		
BSMT TO FL	46.1	3.5	9.5	3.32		
FLOOR PERMI	37.5	.9	12.7	4.81		
FLOOR PENTPE	60.4	.9	13.0	4.92		
WINDOWS						
SOUTH	4.1	.38	2.5	1.64		
NORTH	0.0	.00	0.0	0.00		
EAST	1.5	.38	3.9	2.18		
WEST	4.5	.38	11.7	6.55		
AIR CHANGES	.300 AC/hr	514.8 m3	47.6	26.60		

BASEMENT = 20

SENSIBLE HEAT GAIN
FROM PEOPLE (kWh/d) = 0
DAILY BASE ELECTRIC
CONSUMPTION (kWh/d) = 14
DAILY HOT WATER
CONSUMPTION (kWh/d) = 14

MASS LEVEL CHOSEN IS <A>

WINDOW SHADING COEFFICIENTS:
SOUTH = .83 NORTH = 0.00
EAST = .83 WEST = .83
OVERHANG GEOMETRY:
WINDOW HEIGHT = 1.52 m
OVERHANG PROJECTION = .61 m
HEIGHT ABOVE WINDOW = .20 m

NATURAL INFILTRATION
RATE (AC/hr) = .3
FORCED VENTILATION
RATE (AC/hr) = 0

MONTHLY SUMMARY OF
ENERGY CONSUMPTION

MONTH	THERMAL DEMAND kWh/d	SOLAR FRAC	AUX ENERGY kWh/d	TOTAL AUX kWh/d
JAN	153.9	.05	146.6	174.6
FEB	136.3	.08	124.8	152.8
MAR	113.4	.14	97.0	125.0
APR	67.7	.24	51.5	79.5
MAY	36.5	.43	20.9	49.9
JUN	17.9	.73	4.8	32.8
JUL	6.3	1.00	0.0	28.0
AUG	11.2	.91	1.0	29.0
SEP	33.4	.35	21.6	49.6
OCT	57.2	.16	48.0	75.0
NOV	98.6	.06	92.4	120.4
DEC	134.3	.04	128.9	156.9

ESTIMATED ANNUAL SPACE HEATING
[illegible] kWh
[illegible] FRACTION = .15

House Type B2&C

(Year 1976.77)

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*****************************************
*                                       *
*          PROGRAM HOTCAN               *
*     NATIONAL RESEARCH COUNCIL         *
*          OF CANADA                    *
*          DIVISION OF                  *
*          BUILDING RESEARCH            *
*     SASKATOON, SASKATCHEWAN           *
*                                       *
*****************************************
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TE[illegible]
MAIN FLOOR = 21
BASEMENT = 20

SENSIBLE HEAT GAIN
FROM PEOPLE (kWh/d) = 0
DAILY BASE ELECTRIC
CONSUMPTION (kWh/d) = 14
DAILY HOT WATER
CONSUMPTION (kWh/d) = 14

MASS LEVEL CHOSEN IS <A>

WINDOW SHADING COEFFICIENTS:
SOUTH = .83 NORTH = .83
EAST = .83 WEST = .83
OVERHANG GEOMETRY:
WINDOW HEIGHT = 1.52 m
OVERHANG PROJECTION = .61 m
HEIGHT ABOVE WINDOW = .20 m

NATURAL INFILTRATION
RATE (AC/hr) = .3
FORCED VENTILATION
RATE (AC/hr) = 0

BUILDING PARAMETERS

ELEMENT	AREA m2	RSI VALUE m2-'C/W	HEAT LOSS W/'C	% SEASONAL	HEAT LOSS
CEIL	79.6	3.5	22.6	11.56	
WALLS	89.2	2.1	42.2	21.61	
DOORS	3.3	1.2	2.6	1.35	
BSMT AB.GR.	31.6	.4	89.6	45.86	
BSMT 300mm	0.0	.0	0.0	0.00	
BSMT TO FL.	0.0	.0	0.0	0.00	
FLOOR PERMI.	0.0	.0	0.0	0.00	
FLOOR CENTRE	0.0	.0	0.0	0.00	
WINDOWS					
SOUTH	1.1	.38	2.9	1.50	
NORTH	1.1	.38	2.9	1.50	
EAST	1.7	.38	4.4	2.25	
WEST	3.5	.38	9.3	4.75	
AIR CHANGES	.300 AC/hr	203.0 m3	.16.8	.9.62	

[illegible]
[illegible] = 1.77 kW

MONTH	TOTAL HOUSE LOAD kWh/d	MASS SOLAR GAIN kWh/d	HEATER LOAD kWh/d	TOTAL COST kWh/d
	kWh/d			
JAN	181.8	.04	174.7	202.7
FEB	158.3	.07	147.2	175.2
MAR	129.2	.12	113.4	141.4
APR	72.0	.21	57.0	85.0
MAY	34.1	.40	20.6	48.6
JUN	12.5	.73	3.4	31.4
JUL	0.0	1.00	0.0	28.0
AUG	6.4	.93	.5	28.5
SEP	34.5	.30	24.0	52.0
OCT	83.6	.14	54.8	82.8
NOV	114.7	.05	108.7	135.7
DEC	159.3	.03	153.1	181.1

MONTHLY SUMMARY OF ENERGY CONSUMPTION

ESTIMATED ANNUAL SPACE HEATING
[illegible] or 25340.77 kWh
ANNUAL SOLAR FRACTION = 11

House Type D

(Year 1978, 79, 80)

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* * * * * * * * * * * * * * * * * *
*                                   *
*        PROGRAM HOTCAN             *
*   NATIONAL RESEARCH COUNCIL       *
*        OF CANADA                  *
*      DIVISION OF                  *
*   BUILDING RESEARCH               *
*   SASKATOON, SASKATCHEWAN         *
*                                   *
* * * * * * * * * * * * * * * * * *
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BASEMENT = 20

SENSIBLE HEAT GAIN
FROM PEOPLE (kWh/d) = 0
DAILY BASE ELECTRIC
CONSUMPTION (kWh/d) = 14
DAILY HOT WATER
CONSUMPTION (kWh/d) = 14

MASS LEVEL CHOSEN IS <A>

WINDOW SHADING COEFFICIENTS:
SOUTH = .72 NORTH = .72
EAST = .72 WEST = .72
OVERHANG GEOMETRY:
WINDOW HEIGHT = 1.52 m
OVERHANG PROJECTION = .61 m
HEIGHT ABOVE WINDOW = .20 m

NATURAL INFILTRATION
RATE (AC/hr) = .25
FORCED VENTILATION
RATE (AC/hr) = 0

BUILDING PARAMETERS

ELEMENT	AREA m2	RSI VALUE m2-'C/W	HEAT LOSS W/'C	% SEASONAL	HEAT LOSS
CEIL.	87.9	7.0	12.5		9.91
WALLS	83.9	3.5	23.8	19	92
DOORS	3.3	1.2	2.6		2.10
BSMT AB GR	33.2	3.5	9.4		7.49
BSMT 500mm	23.4	3.5	5.5		3.95
BSMT TO FL	37.1	3.5	7.9		4.25
FLOOR PERMI	27.4	.9	9.8		5.25
FLOOR CENTRE	64.4	.9	13.9		7.46
WINDOWS					
SOUTH	.6	.56	1.1		.90
NORTH	1.3	.56	2.3		1.81
EAST	2.0	.56	4.6		3.62
WEST	5.3	.56	9.4		7.45
AIR CHANGES	250 m3/hr	455.5 m3	35.1	27	90

DESIGN HEAT LOSS
AT -30 C (-22 F) = 1.48 kW

MONTHLY SUMMARY OF ENERGY CONSUMPTION

MONTH	THERMAL LOAD kWh/d	MSFAR MONTHLY	SOLAR FRAC	AUX HEAT kWh/d	HOT WATER kWh/d	TOTAL CONS kWh/d
JAN	100.5		.07	93.4		121.4
FEB	88.9		.13	77.2		105.2
MAR	73.6		.22	57.2		85.2
APR	43.1		.36	27.5		55.5
MAY	21.9		.59	9.0		37.0
JUN	9.2		.89	1.0		29.0
JUL	1.2		1.00	0.0		28.0
AUG	4.3		1.00	0.0		28.0
SEP	19.1		.60	7.6		35.6
OCT	35.1		.26	26.0		54.0
NOV	63.0		.10	56.9		84.9
DEC	87.1		.06	82.0		110.0

ESTIMATED ANNUAL SPACE HEATING
AT -30 C, OR 13249.84 kWh
ANNUAL SOLAR FRACTION = .20

2. Per Work Statement 2.3 (c):

"With the appropriate data collected by J.J. Bell, SRC will evaluate the existing heating equipment used in Brabant Lake on the bases of design and provide estimated system efficiency.

SRC will identify the state-of-the-art of the domestic wood heating equipment which is applicable to the community, Brabant Lake, with evaluation of their design based on the manufacturer supplied information."

Present Standards and Wood Stove Efficiency

At present, criteria for testing the efficiency of wood burning stoves and furnaces has not been standardized. This means that testing agencies have develped their own methods to establish the efficiencies. In turn, this means that efficiency ratings can vary depending on the criteria used to perform the testing.

Some of the variables which can effect stove and furnace efficiency are:

Fuel	Equipment	Distribution	Operation	Maintenance
Type of Wood - hard wood - soft wood Moisture Content	Type of Stone or Furnace - Non Air-Tight - Air Tight - Catalytic	- Fans - Connection - Gravity	- Control of Dampers - Amount of Fuel - Slow Burn - Fast Burn	- Cleaning - Repair of Controls

If wood burning stoves and furnaces are categorized as, non-airtight, airtight, and catalytic, it is found the majority of stoves and furnaces within each category fall into an efficiency range. This efficiency range is as follows:

Non-Airtight - 40% to 60% efficiency range

Airtight - 50% to 70% efficiency range

Catalytic - 65% to 75% efficiency range

(It should be noted that efficiency can drop to 20% if a stove or furnace is poorly operated or maintained.)

At present, a standard is being produced, which will standardize the criteria used to establish the efficiency ratings of wood burning stoves and furnaces. This new standard will be known as the Oregon Standard, and will be adopted by both U.S. and Canada testing agencies.

Evaluation of Existing Heating Equipment.

Mr. Bells survey of existing heating equipment indicates the following:

Design/Type	Manufacture	Estimated Efficiency
1. Combination Oil/Wood	Inter City Gas	Oil 70% Wood 50%-70% (estimated
2. Wood	Valley Comfort	67%
3. Oil Furnace		70%
4. Lightweight (Tin) Airtight Wood Heater		40%-70% estimated

Identification of State-of-the-Art Wood Heating Equipment Applicable to the Community

In considering state-of-the-art equipment applicable to the community, it becomes necessary to examine as many variables and options as possible. As a result, the following headings were used to examine and evaluate the situation.

a) Fuel Source
b) Safety
c) Heat Distribution
d) Life Style
e) Costs
f) Domestic Hot Water
g) Type and Condition of Existing Equipment
h) Available State-of-the-Art Equipment.

Results are as follows:

a) Fuel Source

At present, Brabant Lake residents have been using fire killed wood. This wood was killed in the early 1960's and has provided the residents with an excellent supply of very dry wood for burning. However, air-photo analysis indicates this source of fuel will be depleted in the next few years. After which it will necessary to harvest green wood as fuel. This green wood will have much higher moisture contents, and will result in higher creosote levels. In turn, increasing the potential for chimney fires.

b) Safety

Many safety considerations are invalued in the use of wood burning stoves and furnaces. The main considerations of wood heat safety can be categorized as follows:

1) Safe installation of equipment, including:
   - clearances from combustible materials,
   - flue pipe and chimneys.

2) Safe operation and maintenance of equipment, including:

- stoking the fire,
- flue pipe dampers
- flue pipe and chimney inspections and cleaning,
- maintenance of stoves and furnaces,
- chimney fires,
- smoke detectors,
- fires starting around the stove or furnace.

c) Heat Distribution

Heat distribution is often a problem with space type wood heaters. It is often found that space heaters over-heat the areas or rooms in which they are located. While other areas or rooms are cold do to uneven heat distribution. Because most houses today are designed to have central heating systems, the layout of rooms do not take into account the open spaces required for proper heat distribution from wood burning space heaters.

d) Life Style

A major factor, if not the most important factor, in a study of this nature, is to successfully match technology to the culture its applied in. It is realized that people have to live with the end-product of technology, and in the case of northern housing. Living with the end-product can mean a considerable amount of time.

Mr. Bell has indicated that residents of Brabant Lake leave their houses unattended for long periods of time while they are out on trap lines etc. As a result, they like houses which require easy operation, low maintenance, and utility systems (heating, plumbing, and electrical) which can be left unattended. In the winter this means utility systems which can freeze-up and be started-up again on short notice and with little preparation. This also means, that houses which can not be left unattended create extra cost and nuisance.

e) Costs

Detailed costs will be handled in the next work statement 2.3 (d). However, a brief overview of costs is required at this point to add prespective to the analysis.

Mr. Bell conducted an infield study at Brabant Lake to arrive at the cost of cutting and hauling a cord of wood. The study found that the actual capital out-lay which included fuel for a snowmobile and chainsaw, plus equipment depreciation etc., came to $8.00 per cord. The time required to cut and haul a cord came to 8 man-hours. However, the study found that the children (students) of Brabant Lake do the majority of wood cutting and hauling. As a result, Mr. Bell felt the minimum wage of $4.25 per hour was more than adequate for the labour component.

The results of the study can be summarized as follows:

- actual capital outlay per cord of wood $8.00
- labour at $4.25/hr. for 8 hours $34.00

Total $42.00/chord.

Applying this information to the HOTCAN computer runs indicate the following costs for space heat.

6 chords	- actual cost	$48.00/yr.
	- actual cost plus labour -	$336.00/yr.
10 chords	- actual cost	$80.00/yr.
	- actual cost plus labour -	$420.00/yr.
20 chords	- actual cost	$160.00/yr.
	- actual cost plus labour -	$840.00/yr.

It should be noted that if only the actual costs are used. Space heating costs in Brabant Lake range from:

6 chords - $48.00/yr.

10 chords - $80.00/yr.

20 chords -$160.00/yr.

f) Domestic Hot Water

Previous studies by the National Research Council (NRC) which are included in the HOTCAN computer program, indicate the average family uses approximately 898 m^3 of domestic hot water per year. It is calculated that 5100 KWh of electricity are required to heat the water or 425 KWh per month.

In Brabant Lake electrical costs are:

3.986/KWh for the first 315 KWh.

19¢/KWh after the first 315 KWh.

If it is assumed the first 315 KWh are used for lighting etc., and if 425 KWh were used to heat hot water. The cost would be 425 KWh x .19 $/KWh = 80.75/ month. It should be noted this is an example only, as hot water consumption in Brabant Lake is not known. However, it does illustrate that domestic hot water costs are probably much higher than space heating costs.

g) Type and Condition of Existing Equipment

Mr. Bell has indicated a wide range of wood burning stoves and furnaces. Ranging from tin air-tight stoves to combination oil/wood furnaces.

One area he noticed where equipment could be up-graded was in flue pipe and chimneys. Because flue pipe and chimneys fires are common. It is felt this is a major area which could be up-graded.

h) Available State-of-the-Art Equipment

After considering all the available information to identify state-of-the-art domestic wood heating equipment which would be applicable to the Brabant Lake community, the following list of priorities was established:

- the equipment should have the ability to supply the majority of space heat required;
- the equipment should be able to be used for cooking (as opposed to the electric hot plates now in use);
- the equipment should have the capability to heat water for domestic hot water;
- the equipment should be easy to use, and maintain;
- the equipment should have a high degree of safety.

The type of stove best suited to the preceeding criteria is the wood/coal/peat cookstove. The state-of-the-art cookstove meeting this criteria is "The Stanley Cookstove", which is made in Ireland. However, there are also some excellent Canadian made cookstoves which are manufactured by Findlay, Enterprise, Dandy, and Fawcett.

Air-tight cookstoves have efficiency ranges of 60% to 65%, and all have some method of heating hot water. These stoves will be identified and discussed later in the report.

It should be noted the limitations of a cookstove are the space required as they are fairly large, and the problem of heat distribution and overheating of kitchen areas in houses which were not designed for them. A compromise to the size problem, may be a small air-tight stove fitted with a coil for domestic hot water, but without an oven for baking.

Discussion of Results and Recommendations

Safety

An air-photo analysis of the Brabant Lake area indicates the source of fire-killed wood now being used will be depleted in perhaps 3 to 5 years. When this wood is depleted it will become necessary to burn green wood. In turn this will create increased creosote build-up, and the potential for increased flue pipe and chimney fires.

As a result, it is recommended more careful inspections of existing flue pipes and chimneys be made, and product research be conducted into the possibility of up-graded alternatives.

Life Style

It is recommended the residents of Brabant Lake be consulted for their opinions on the use of cookstoves or smaller wood burning stoves which could be used for cooking and heating domestic hot water.

Heat Distribution

It is recommended a study be conducted in Brabant Lake houses to see if a suitable method could be found to distribute heat throughout an existing house. Possibilities in this area would include:

- employing the existing forced air system;
- by the placement of additional fans in door ways etc., throughout the house.

Appendix 4

Community Income and Energy Cost Subsidies

COMMUNITY INCOME AND ENERGY COST SUBSIDIES:

Survey Results

Eight repondents to the survey indicated that most of the annual household income was obtained through trapping activities. One respondent has full time, salaried employment. Two others estimate that the largest portion of annual household income comes from Social Assistance.
Our enquiries to the Provincial Department of Social Services indicate that there are presently (Dec. 83) no Brabant residents receiving Social Assistance through the province. This may be a temporary aberration since some residents have received assistance in the past.
The La Ronge Indian Band Welfare Administration indicates that there are 23 Treaty Indian households in Brabant, and that most of them receive benefits for at least part of the year (usually winter).
We would therefore have to assume that Social Assistance, in its various forms, contribute significantly to community cash income, although perhaps slightly less than a combination of childrens allowance, old age pension, U.I.C. and trapping income.
In addition to trapping, part-time employment is seasonally and sporadically available for line cutters and building construction workers, as well as services to the school (janitorial, teaching assistants) and "Canada Works" type programs.

Social Assistance and Energy Costs:

Social Assistance programs (both provincial and federal) divide clients into two basic groups -
(1) employables - those who could support themselves and their dependents if employment were available.

(2) unemployables - those, who for health reasons or social circumstances, are unable to work , even if work were available.

The two programs both include a heating fuel subsidy for clients, although the provincial program is slightly more generous.

(1) Provincial S.A.P. -

For both "employables" and "unemployables" will pay actual fuel costs, supported by receipts. This becomes a bit cumbersome, so a standard "fuel oil" quantity and cost has been calculated for each community. The department has estimated that for the period October 1 to April 30 the average home will consume 3 barrels (135 gallons) of oil per month. Based on the September 1983 cost of delivered oil at Brabant, that quantity is estimated to cost $225.45. Each eligible resident of Brabant, who indicates that he is using fuel oil as the primary source of home heat, has that amount added to the monthly social assistance allocation, for the "winter months". Since the department does not have enough staff to be able to monitor who is burning fuel oil, and who is not, that additional money can be spent as the householder sees fit.

(2) Indian Affairs/Band Welfare:

Unemployables - D.I.A.N.D policy allows for the disbursement of actual utility costs, which usually turn out to be estimates, based on the workers knowledge of energy costs for the unit in question.

Employables - A maximum of $55.00 per month is added to the monthly total from September 1 to April 30. It is intended that this should be used to purchase or harvest wood. It is recognized that this would be insufficient for oil, propane or electrical heat, but the ratioale is that the employable householder can obtain his own fuel wood.

While the calculations for levels of Social Assistance to each family are complex, in simplified form, they are as follows:

D.I.A.N.D.	(a)	Utilities	$ 55.00 (winter months)
	(b)	Household	60.00 (all year)
	(c)	Each adult	148.00
	(d)	Each child	132.00
	(e)	Rent	110.00 (if applicable)

minus childrens allowance, old age security, U.I.C., and

25% of income earned from part time employment.

Provincial - Essentially the same except $225.45 (winter months) for utilities or actual supported by receipts if higher. Also actual rent if higher than $110.00 if applicable.
(The Lac La Ronge Band disburses an average $200,000.00 per month to Band Members through its Welfare program).

Appendix 5

Hand-out Materials

Heat From Wood

I. HEAT ENERGY FROM WOOD

Using wood as a source of heat energy is something that northerners have been doing for hundreds of years. Equipment used to convert wood into heat energy has been simple, inexpensive, and fairly safe. When people lived in scattered camps, everyone had easy access to a supply of dry fire wood.

For modern northern communities, there have been two important changes in the way that fuel wood is used, that effect safety.

1. Fuel Wood Supply

With large numbers of people now living in communities, and everyone wanting to get their fuel wood close-by, there is increased competition for the dry, seasoned wood. The result is that more people are burning green wood. When green wood is burned in furnaces and space heaters, the amount of creosote that builds up in pipes and chimneys is increased. And so is the possibilitiy of serious chimney fires.

2. Energy Efficient Furnaces and Space Heaters

Modern wood burning furnaces and space heaters are designed to get as much heat as possible out of a log of wood. In some ways, this is good. We use less wood. We don't have to refuel the fire so often.

But this modern equipment needs to be maintained more carefully than the older equipment.

Closing off the air supply to slow down the rate of burn results in more creosote building up in the pipes and chimneys. Creosote causes chimney fires.

II. LIVING HAPPILY WITH MODERN FURNACES AND SPACE HEATERS

Usually, your wood fired furnace or space heater will be good to you, if you are good to it.

To keep your furnace/space heater happy:

1. Feed it only dry, seasoned wood.

2. Feed it fairly small amounts, and often.

3. Give it a good air supply. Open windows in mild weather instead of closing drafts.

4. Clean the chimney regularly with brush type cleaners. Once or twice a year may be often enough, but check every month or so to be sure creosote is not building up.

These units will give many years of trouble-free service if they are well looked after.

Chimney Fires

I. PREVENTION

The best way to avoid any problems with chimney fires is to make sure they don't happen.

Chimney fires occur when creosote that has built up in the chimney, burns. Creosote burns at very high tempeture. Sometimes the chimney cannot contain these high tempetures and fire spreads to the rest of the house.

You will never have a problem with chimney fires if you do not allow creosote to build up. All wood-burning appliances create some creosote. Whether they create a little or a lot depends upon how you use them.

To keep creosote build-up to a minimum:

1. Use only dried wood.

2. Burn small, hot fires.

3. Do not burn plastic containers or other garbage in your stove.

4. Burn a "roaring" fire once a day.

5. Remove the clean-out cap and inspect your chimney regularly. If creosote is getting thick, have the chimney cleaned right away.

II. STOPPING A CHIMNEY FIRE

If you forget to do all of these things and a chimney fire starts, you should:

1. Get everyone out of the house.

2. Throw a small quantity (one or two cups) of water into the fire box. Or throw a shovel full of snow down the chimney from the roof.

3. Close off the air supply by closing drafts and dampers.

4. Wait for the chimney to cool down before restarting a fire.

5. Inspect the chimney for damage before restarting the fire. The cost of replacing a damaged chimney may be paid under your house insurance program, or under the R.R.A.P. program. Check with Saskatchewan Housing Corporation.

High Electrical Costs in Northern Communities- What Can Be Done?

I. COOKING AND WATER HEATING IN THE MODERN HOME

In the past, northern homes were usually equiped with one wood fired heater. This one unit provided three household needs:

a) It heated the living space.
b) It was used for cooking food
c) It provided a surface for heating water for household use.

Most modern northern homes are now equiped with a combination wood/oil furnace, or a space heater. These units are good for providing space heat, but offer no surface for cooking or heating water.

As a result, northerners have to use electric ranges, kettles, and water heaters for cooking or heating water. Electricity is safe and easy to use, but in northern communities served by deisel generators, it is very expensive.

II. REDUCING COSTS FOR COOKING AND WATER HEATING

Occupants of homes equiped with hot and cold water under pressure will know that their electrical bills are very high in winter. Some residents are saying that high electrical costs makes it almost impossible to be able to afford to live in these homes.

There are at least two things a resident can do to try to solve the problem before he gives up and moves out.

A. Residents in deisel electrified communities in Saskatchewan can organize an appeal to the Public Utilities Review Commission to have the electrical power rates reduced to the general provincial level. The local Council should be able to demonstrate to the Commission that the rates charged in deisel communities, along with the effects on electrcial consumption that are the result of the government funded housing program, put northerners in an unfair cost squeeze.

B. Another possible answer to the problem that is worth considering even if the cost of power is reduced, is to install woodfired cook-stove, or a circulating hot-water "jacket" on a cook-stove, a furnace, or a space heater.

These units would greatly reduce the amount of electrical power that was needed for heating water or cooking food.

III. SOME PROBLEMS --- AND POSSIBLE SOLUTIONS

A. Good quality cook-stoves are fairly expensive. They are heavy, and transporting them into remote communities adds to the expense.

However --- there are several government programs that will give you grants, or low-interest loans that would cover nearly all of the costs. (Details on these programs and how you can apply, are included in another pamphlet in this series).

The amount of money you save on power bills will help to quickly repay loans.

B. There isn't much room for a cook-stove in the kitchen of the new houses. A wood stove needs clearance from walls and cupboards to be operated safely.

But ---- some of the newer model stoves need very little clearance. In some houses, it may be possible to enlarge the kitchen area. In others, it may make sense to put a cook stove where the space heater is sitting now.

For the long-term future, northerners will have to convince housing authorities that new northern housing should be designed so that wood-fired cook stoves can be used for space heat, as well as cooking and water heating. In the meantime, it will be necessary to select a wood stove, and a place to put it, very carefully.

C. In many of the houses, adding another wood-fired stove will mean adding another chimney. Chimneys are expensive, and a bit complicated to install.

However ---- the cost of installing a new chimney might be covered under some of the home-improvement grants or loans described in another pamphlet.

D. Hooking a "water jacket" up to a hot water tank looks like it would be complicated and expensive. A plumber would be needed to do the installation.

But --- once again, most of the cost, including the plumbers wages, might be covered under grants or loans programs.

Travel costs can be reduced and shared if several home owners install the equipment at the same time.

IV. Most northerners would prefer to live in housing that had piped water and sewage disposal.

Under the present circumstances, only people with full time employment can afford to live in these houses. Most northerners cannot afford the high cost of the electrical power these houses consume.

Deisel generated electrical power rates are very high and should be reviewed with consideration of the health and social objectives of the public housing program.

Wood fired systems for cooking and water heating would greatly reduce the amount of electricity consumed, and the costs to homeowners. A number of government sponsered grants and loans programs are available to help pay the cost of installing more appropriate home appliances.

Grants and Loans for Home Improvements

I. WHY WOULD ANYONE GIVE AWAY MONEY?

Both the Federal and the Provincial governments want Canadians to cut back on the amount of oil they are using. Canada will then be able to reduce the amount of oil imported from other counties, and Canada would save money.

If more people converted from oil to wood fired heating systems, or cut back on the amount of deisel generated electricity, the country would use less oil.

To save money on energy costs usually means we have to spend money on new heating equipment. Over time, the savings to the homeowner might be greater than the cost of new equipment. But not everyone has the cash in his pocket to go out and buy new equipment. So both levels of government have programs to make cash available through grants or loans, to be used for "home improvements" which reduce oil consumption.

II. SASKATCHEWAN PROGRAMS

1. Enerwise -

A loan program administered by North-Sask Electric Ltd. for up to $3,000.00 to assist the homeowner to reduce the amount of electrical energy consumed. All homeowners who are not in arrears with North-Sask Electric are eligible. The money must be repaid over 5 years. Payments are added to the electrical bill.

Loan money could be used to purchase a wood fired cook stove, or water-heating jackets.

Application forms and further information is available at the Council office.

2. Additional Programs for Senior Citizens

If you are a home-owner, over 65 years of age, you may be eligible for a home repair GRANT of up to $650.00. This program is administered through Sask Housing Corporation. Senior Citizens in arrears on mortgage payments would not be eligible.

III. FEDERAL GOVERNMENT PROGRAMS

1. Canada Oil Substitution Program (C.O.S.P.)

   This program will pay ½ of the cost of replacing your oil furnace with a wood-fired space heater or cook-stove, or water heater, up to a maximum of $800.00. Eligible costs would include paying installation of water pipes or chimneys by a contractor.

   You must get approval of the changes you are going to make, before you make them. If they are approved, C.O.S.P. pays the supplier/contractor one half of the cost (up to $800.) and you pay the other half.

   Application forms will be mailed to you if you call 112-800-667-9719. There is no long distance charge.

2. Canadian Home Insulation Program (C.H.I.P.)

   Provides a one time grant of up to $500.00 to upgrade insulation in your home, or repair seals around doors or windows. Only homes built before 1980 are eligible..

   Information and application forms are available from Energy, Mines and Resources Office in Saskatoon. Call 112-800-667-9719 toll free.

The Role of Council in Fire Prevention

I. Most northern communities have very little fire-fighting equipment. Maintaining a "fire department" with pumps trucks and trained fire-fighters, is very expensive.

But there a number of inexpensive things that a Council might consider doing to PREVENT house fires from happening, even if they can't do much after a house fire has started.

II. **SUGGESTED INITIATIVES**

1. Making a Supply of Seasoned Wood Available

Many home owners are finding it more and more difficult to obtain a supply of dried fire-wood. Good firewood is often several miles away. As near-by dry wood is used up, the cost of hauling firewood increases.

People begin to use green wood for fire-wood, and the chance of chimney fires, some of which will become house-fires, increases.

Councils in northern communities usually have access to government "job creation" programs. Councils should apply through these programs to undertake a program of supplying seasoned wood to community residents.

Green spruce or pine, limbed and sawn to 4 foot or 8 foot lengths, and stacked, will take 2 seasons to dry to a safe moisture content. Council would have to plan its wood harvesting program well in advance. Planning should assume that each home will consume an average of 10 cords of dried wood in one heating season.

Canada Employment and Immigration Commission (Manpower) indicate that they would consider an application for this type of program.

2. Purchase of Chimney Cleaning Equipment

Brushes, push rods, ropes and weights for properly cleaning factory built chimneys, are generally not available in northern communities. Since they might only be used by each homeowner two or three times a year, most people do not bother buying them, even though the cost of a complete set of chimney cleaning equipment would be less than $100.00.

It is well known that the only safe and effective way to remove creosote build up from chimneys, is with proper cleaning equipment.

In order to reduce the risk of a serious house fire resulting from improperly maintained chimney's. Council might consider:

a) encouraging a local business to purchase the necessary equipment and charging homeowners a fee for chimney cleaning.

b) purchasing chimney cleaning equipment and making it available to local homeowners on a loan basis.

3. Making Sure Each Home Has an Operating Fire Extinguisher

A good Fire Extinguisher can cost up to $60.00. They should be inspected and recharged if necessary every 2-3 years.

Becasue of the expense, very few northern homes have one. Yet, most people know they can save lives and property damage, especially in fighting fires that start accidentally such as:

a) electrical fires

b) fires that involve gasoline or fuel oil.

c) fires resulting from overheated cooking oils, grease or fat.

A well maintained fire extinguisher, used properly, can prevent small fires from becoming big fires.

Council might consider various ways of ensuring that each home is properly equiped with fire extinguishers.

3.1. Council might negotiate with the housing authorities (C.M.H.C., Sask. Housing, D.I.A.N.D.) to provide the equipment, if Council agreed to maintain it, and ensure residents were briefly trained to use it.

3.2. Council might purchase units to be installed in each home, and maintained by Council.

3.3. Council might pass a by-law requiring that each residence had an operating fire extinguisher, and enforce it.

4. Hire a Fire Chief

On the basis of a hundred years or more of experience, southern municipal councils have discovered that the most effective way of ensuring that fire prevention gets proper attention is to make one person responsible.

Northern Councils might consider a similar approach, either by hiring a community resident for a nominal fee ($50 to 100 per month) or naming one member of council as the person who worries about fire prevention.

The Fire Chief duties might include:

4.1. Ensuring that fire extinguishers are installed and working properly, and that residents know how and when to use them.

4.2. Ordering and maintaining chimney cleaning equipment, and keeping track of who has borrowed it, and where it is now.

4.3. Co-ordinating the annual fuel wood harvest to ensure an adequate supply of seasoned wood.

4.4. Co-ordinating and directing fire-fighting efforts in and around the community.

4.5. Obtain information and/or take training in the proper installation and maintenance of wood-burning equipment so that he/she could provide advice to residents.

4.6. Possibly do periodic inspections to ensure that wood-burning equipment was being safely maintained.

III. SPENDING COMMUNITY MONEY ON FIRE PREVENTION

Nearly all of the suggestions to Councils in this handbook involve spending some of the limited amount of money available for local improvements.

Most northern homes use wood as a main source of heat energy. Modern wood-burning equipment can be the cause of house fires, if it is not properly installed and maintained. Information obtained from Fire Insurance companies indicates that the incidence of house fires is higher in the north than in the south, on a per capita basis.

It would seem important that local councils take whatever preventative measures they can, to save lives and property in their community.

House Fires in Brabant Lake

I. Most of the fire-wood being used at Brabant in the winter of 1983-84 is being cut from bush that was killed by fire over 20 years ago. The wood is very dry.

Compared to other northern communities, Brabant Lake has had very few problems with house fires caused by chimney fires. We believe the reason is that residents are using very little green wood for fuel. Other communities who do not have such easy access to a dry wood supply, have more chimney fires.

II. Because the burn that provides most of the fuel wood supply is very old, good dry wood is getting harder to find. Within the next few years, it will have fallen and begun to rot.

Soon, people will begin to add more and more green wood to their fuel wood mix. As the amount of green wood burned increases, so, we expect, will the number of chimney fires, and possible house fires.

For these reasons, it is important that the people of Brabant Lake are aware of the ways that wood fuel can be used safely.

Appendix 6

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